OIPE JC109 OCT 06 2003 PATENT & TRADEMARK OFFICE

IN THE US PATENT AND TRADEMARK OFFICE

September 25, 2003

Applicants: Bobby A. Dixon, et al.
Title : METHOD OF TREATING CERAMIC CORES
Serial No.: 09/805,426 Group: 1725
Filed : March 13, 2001 Examiner: L. Tran
Confirmation No. 2086

Commissioner for Patents
P.O. Box 1450
Alexandria, VA 22313-1450

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APPELLANT'S BRIEF ON APPEAL

Dear Sir:

This is an appeal from the decision of the Examiner dated June 3, 2003, finally rejecting claims 1, 3 and 5-12.

REAL PARTY IN INTEREST

The real party in interest is Howmet Research Corporation, the assignee of the entire right, title and interest in the above application.

RELATED APPEALS AND INTERFERENCES

There are no appeals or interferences known to Applicant or the undersigned which will directly affect, or be affected by or have a bearing on the Board's decision in the appeal.

STATUS OF CLAIMS

Claims 1, 3, and 5-12 are pending, finally rejected, and are the claims on appeal. Claims 2 and 4 have been canceled. The pending claims appear in the Appendix.

STATUS OF AMENDMENTS

A response to the final rejection was filed. The response has been entered.

SUMMARY OF THE INVENTION

Applicants' invention as defined by independent claim 1 is directed to a method of treating a ceramic core after molding and before firing for use in casting molten metallic material. The method involves the steps of placing an unfired ceramic core having a

molded core shape and having an organic binder on at least one setter and placing the at least one setter and the unfired ceramic core thereon on a conveyor that conveys the at least one setter and the unfired core through a heating oven wherein the setter and the unfired ceramic core are heated to an elevated temperature at or above a softening temperature of the binder effective to soften the binder to reduce distortion of the unfired ceramic core. The setter and the unfired ceramic core having softened organic binder are removed from the oven to cool to ambient temperature (see specification page 2, lines 5-17; page 7, lines 4-10 and lines 31-35; page 8, lines 14-21, and core 10, setters 40, 42 and conveyor 50 of Figure 1 and Figure 3).

Claim 3 depends from claim 1 and involves the step of controlling the rate of travel of the conveyor such that the at least one setter and the unfired ceramic core are heated to the elevated temperature when they are located proximate an exit opening of the heating oven (see specification page 2, lines 22-26; page 7, lines 31-35 and Figure 3).

Claim 5 depends from claim 1 and describes that the setter supplies heat to the unfired ceramic core after removal from the heating oven and during cooling to ambient temperature (see specification page 2, lines 28-32; page 8, lines 17-21 and core 10 and setters 40, 42 of Figure 1).

Claim 6 depends from claim 1 and describes that the unfired ceramic core conforms to a surface of the setter by being heated to the elevated temperature (see specification page 2, lines 11-14 and page 8, lines 22-26 and Figure 1).

Claim 7 depends from claim 1 and describes that the unfired ceramic core is placed between a top setter and a bottom setter and is conveyed through the heating oven between the top setter and bottom setter (see specification page 5, lines 18-30 and page 6, lines 10-14; and setters 40, 42 of Figure 1, 1A).

Claim 8 depends from claim 1 and describes that the unfired ceramic core includes an airfoil region (see specification page 3, lines 2-5; page 4, lines 30-31 and airfoil region 14 of Figure 2).

Claim 9 depends from claim 1 and describes that the binder comprises a thermosetting binder (see specification page 3, lines 33-35 and page 8, lines 4-10).

Claim 10 depends from claim 1 and describes that the binder comprises a thermoplastic binder (see specification page 3, lines 25-26).

Claim 11 is an independent claim that involves a method of treating a ceramic core after molding and before firing for use in casting molten metallic material and that includes the steps of heating an unfired ceramic core having a molded core shape and having an organic binder on at least one setter in a heating oven to an elevated temperature at or above a softening temperature of the binder effective to soften the binder to reduce distortion of the unfired ceramic core and removing the at least one setter and the unfired ceramic core having softened organic binder from the oven to cool to ambient temperature (see specification page 2, lines 5-17; page 7, lines 4-10 and lines 31-35; page 8, lines 14-21, and core 10, setters 40, 42 and conveyor 50 of Figure 1 and 3).

Claim 12 depends from claim 11 and describes that the unfired ceramic core includes an airfoil region (see specification page 3, lines 2-5; page 4, lines 30-31 and airfoil region 14 of Figure 2).

ISSUES

FIRST ISSUE

The first and only issue presented for review is whether the subject matter of claims 1, 3, and 5-12 is obvious under 35 USC 103(a) in view of the Frank et al. US Patent 4 837 187 or European document EP 0 914 883 taken with the Japanese document JP-3-97675.

GROUPING OF THE CLAIMS

Claims 1, 3, and 5-12 do not stand or fall together. Claims 1 and 11 are independent claims which are separately patentable since claim 1 further recites the step of placing the at least one setter and the unfired ceramic core thereon on a conveyor that conveys the setter and the unfired core through a heating oven. Depending claim 3 is separately patentable from claim 1 in further reciting controlling the rate of travel of the conveyor such that the at least one setter and the unfired ceramic core are heated to the elevated temperature when they are located proximate an exit opening of the heating oven. Depending claim 5 is separately patentable from claim 1 in further reciting that the at least one setter supplies heat to the unfired ceramic core after removal from the heating oven and during cooling to ambient temperature. Depending claim 6 is separately patentable from claim 1 in further reciting that the unfired ceramic core conforms to a surface of the at least one setter by being heated to the elevated temperature. Depending claim 7 is separately patentable from claim 1 in further reciting that the unfired ceramic core is placed between a top setter and a bottom setter and is conveyed through the heating oven between the top setter and bottom setter. Depending claim 8 is separately patentable from claim 1 in further reciting that the unfired ceramic core includes an airfoil region. Depending claim 9 is separately patentable from claim 1 in further reciting that

the binder comprises a thermosetting binder. Depending claim 10 is separately patentable from claim 1 in further reciting that the binder comprises a thermoplastic binder. Depending claim 12 is separately patentable from claim 11 in further reciting that the unfired ceramic core includes an airfoil region.

ARGUMENT

FIRST ISSUE:

The rejection of claims 1, 3, and 5-12 as obvious under 35 USC 103(a) in view of the Frank et al. US Patent 4 837 187 (Frank '187 patent) or European document EP 0 914 883 (EP '883 document) taken with the Japanese document JP-3-97675 (Japanese '675 document) is in error.

With respect to the Frank '187 patent, the examiner alleges that the Frank '187 patent discloses "a method of treating a ceramic core after molding and before firing for use in casting molten metallic material comprising the steps of placing the unfired ceramic core and having organic binder, thermoplastic, on one of the setter, then heating the unfired ceramic core to or above the softening temperature of the binder". The examiner cites column 5, lines 6-21 of Frank '187 patent. Applicants would point out to the examiner that column 5, lines 6-21 relate to subjecting the green core removed from the die to a pre-bake treatment at 232 to 288 degrees C maximum temperature with graphite powder packing material covering the green core to extract or remove the thermoplastic wax-based binder from the ceramic core. In particular, column 5, lines 11-17 of the Frank '187 patent expressly teaches that "[a]fter the core is positioned on bottom half of the ceramic setter, the core is covered with a graphite powder packing material having a relatively fine particle size. During the pre-bake treatment, the graphite powder packing material serves to physically extract, via capillary action, the binder material from the core".

The thermoplastic wax-based binder no doubt is liquid at the temperature of the prebake treatment to allow its extraction by the graphite powder packing material via capillary action as described at column 5, lines 16-17.

In contrast, Applicants pending claims recite, in combination with the other steps set forth, heating the setter and the unfired ceramic core to an elevated temperature at or above the softening temperature of the organic binder effective to soften the organic binder to reduce distortion of the unfired ceramic core followed by removing the setter and the unfired ceramic core having softened organic binder from the oven to cool to ambient temperature.

The examiner should not ignore the recitations in Applicants' claims that the organic binder is softened to reduce distortion of the unfired ceramic core and that the setter and the unfired ceramic core having softened organic binder are removed from the oven to cool to ambient temperature. These recitations of claims 1 and 11 are not disclosed or suggested by the Frank '187 patent.

With respect to the EP '883 document, it is as grossly deficient as the Frank '187 patent since the disclosures cited by the examiner are essentially the same. In particular, page 4, lines 22-29 of the EP '883 document referred to by the examiner also relate to subjecting a green core removed from the die to a pre-bake treatment at 550 to 560 degrees F with graphite powder packing material covering the green core to extract or remove the thermoplastic wax-based binder from the ceramic core. In particular, page 4, lines 25-26 of the EP '883 document expressly teaches that "[a]fter the core is positioned on bottom half of the ceramic setter, it is covered with a graphite powder packing material which serves to physically extract via capillary action the binder from the core in a debinding action".

The thermoplastic wax-based binder no doubt is liquid at the temperature of the prebake treatment to allow its extraction by the graphite powder packing material via capillary action as described at page 4, lines 25-26 of the EP '883 document.

In contrast, Applicants pending claims recite, in combination with the other steps set forth, heating the setter and the unfired ceramic core to an elevated temperature at or above the softening temperature of the organic binder effective to soften the organic binder to reduce distortion of the unfired ceramic core followed by removing the setter and the unfired ceramic core having softened organic binder from the oven to cool to ambient temperature.

Again, the examiner should not ignore the recitations in Applicants' claims that the organic binder is softened to reduce distortion of the unfired ceramic core and that the setter and the unfired ceramic core having softened organic binder are removed from the oven to cool to ambient temperature. These recitations of claims 1 and 11 are not disclosed or suggested by the EP '883 document.

The examiner's argument on page 4, third paragraph of the final rejection that "[t]herefore, Frank et al. and EP'883 disclose the claimed invention as claimed" is utterly incorrect and appears to be based on a misunderstanding of each cited primary reference.

In fact, neither the Frank '187 patent nor the EP '883 document discloses or suggests Applicants' pending claims. Both the Frank '187 patent and the EP '883 document expressly teach away from Applicants' pending claims in physically extracting or removing via capillary action the binder from the core in the pre-bake heat treatment referred to by the examiner. The examiner's

interpretation of the cited references is violative of the principles of the Grahm V. Deere decision, 383 U.S. 1 (1966) since the cited references in fact expressly teach away from Applicants' claims.

The examiner acknowledges on page 3, paragraph 4 of the final rejection that the Frank '187 patent and the EP '883 document do not disclose the method of conveying the setter and the unfired core into a heating oven as set forth in claim 1. The examiner cites Japanese '675 document as allegedly remedying the gross deficiencies of the Frank '187 patent and the EP '883 document in this regard.

However, the Japanese '675 document involves high temperature sintering of ferrite cores by firing in an oxygen-containing gas to produce high magnetic permeability cores as described in the translation of the abstract. A temperature of 1350 degrees C appears on page 455, right hand column, line 8 of the untranslated Japan document. The Japanese '675 document is not believed to be instructive with respect to Applicants' claims given that the Japanese '675 document involves high temperature sintering of ferrite cores via firing at over 1300 degrees C to produce high magnetic permeability ferrite cores. The examiner should not and cannot under accepted patent examining principles of the Grahm V. Deere decision select only the disclosure of a conveyor out of the Japanese '675 document while ignoring that the Japanese '675 document involves sintering ferrite cores to obtain high magnetic permeability and sintering temperatures of over 1300 degrees C.

Moreover, the combination of the Japanese '675 document with the Frank '187 patent or the EP '883 document as proposed by the examiner is believed incorrect since the Japanese '675 document

involves sintering (firing) at very high temperatures over 1300 degrees C and the pre-bake treatment of Frank '187 patent and the EP '883 document involves graphite powder packing material covering the green core to extract the organic binder from the ceramic core at relatively low temperatures before firing.

Applicants fail to see any motivation in the cited references to combine the Japanese '675 document with the Frank '187 patent or the EP '883 document. Applicants believe the proposed combination of the Japanese '675 document with the Frank '187 patent or the EP '883 document is violative of the principles set forth in the above Grahm v. Deere decision.

With respect to claim 3, neither the Frank '187 patent, the EP '883 document, nor the Japanese '675 document discloses or suggests controlling the rate of travel of a conveyor such that a setter and an unfired ceramic core are heated to the elevated temperature when they are located proximate an exit opening of the heating oven.

With respect to claim 5, neither the Frank '187 patent, the EP '883 document, nor the Japanese '675 document discloses or suggests supplying heat from a setter to an unfired ceramic core after removal from the heating oven and during cooling to ambient temperature.

With respect to claim 6, neither the Frank '187 patent, the EP '883 document, nor the Japanese '675 document discloses or suggests conforming an unfired ceramic core to a surface of at least one setter by being heated to the elevated temperature by softening organic binder in the ceramic core.

With respect to claim 7, neither the Frank '187 patent, the EP '883 document, nor the Japanese '675 document discloses or suggests placing an unfired ceramic core between a top setter and a bottom setter and conveying the unfired ceramic core through a heating oven between the top setter and bottom setter while softening organic binder in the ceramic core.

With respect to claim 8, neither the Frank '187 patent, the EP '883 document, nor the Japanese '675 document discloses or suggests heat treating an unfired ceramic core that includes an airfoil region to soften organic binder in the ceramic core.

With respect to claim 9, neither the Frank '187 patent, the EP '883 document, nor the Japanese '675 document discloses or suggests heat treating an unfired ceramic core that includes a thermosetting binder in a manner to soften the thermosetting binder.

With respect to claim 10, neither the Frank '187 patent, the EP '883 document, nor the Japanese '675 document discloses or suggests heat treating an unfired ceramic core that includes a thermoplastic binder in a manner to soften the binder. As mentioned above, the Frank '187 patent and the EP '883 document extract or remove the binder via graphite powder by capillary action.

With respect to claim 12, neither the Frank '187 patent, the EP '883 document, nor the Japanese '675 document discloses or suggests heat treating an unfired ceramic core that includes an airfoil region to soften binder in the ceramic core.

CONCLUSION

FIRST ISSUE

It is respectfully submitted that pending claims 1, 3, and 5-12 are not obvious in view of the Frank et al. US Patent 4 837 187 or European document 0 914 883 taken with the Japanese document JP-3-97675.

Respectfully submitted,

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APPENDIX

1. A method of treating a ceramic core after molding and before firing for use in casting molten metallic material, comprising placing an unfired ceramic core having a molded core shape and having an organic binder on at least one setter, placing said at least one setter and said unfired ceramic core thereon on a conveyor that conveys said at least one setter and said unfired core through a heating oven, conveying said at least one setter and said unfired ceramic core through the heating oven to heat said at least one setter and said unfired ceramic core to an elevated temperature at or above a softening temperature of said binder effective to soften said binder to reduce distortion of said unfired ceramic core, and removing said at least one setter and said unfired ceramic core having softened organic binder from said oven to cool to ambient temperature.

3. The method of claim 1 including controlling the rate of travel of the conveyor such that said at least one setter and said unfired ceramic core are heated to said elevated temperature when they are located proximate an exit opening of the heating oven.

5. The method of claim 1 wherein said at least one setter supplies heat to said unfired ceramic core after removal from the heating oven and during cooling to ambient temperature.

6. The method of claim 1 wherein said unfired ceramic core conforms to a surface of said at least one setter by being heated to said elevated temperature.

7. The method of claim 1 wherein said unfired ceramic core is placed between a top setter and a bottom setter and is conveyed through the heating oven between the top setter and bottom setter.

8. The method of claim 1 wherein said unfired ceramic core includes an airfoil region.

9. The method of claim 1 wherein the binder comprises a thermosetting binder.

10. The method of claim 1 wherein the binder comprises a thermoplastic binder.

11. A method of treating a ceramic core after molding and before firing for use in casting molten metallic material, comprising a) heating an unfired ceramic core having a molded core shape and having an organic binder on at least one setter in a heating oven to an elevated temperature at or above a softening temperature of said binder effective to soften said binder to reduce distortion of said unfired ceramic core and b) removing said at least one setter and said unfired ceramic core having softened organic binder from said oven to cool to ambient temperature.

12. The method of claim 11 wherein the said unfired ceramic core includes an airfoil region.

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REAL PARTY IN INTEREST

The real party in interest is Howmet Research Corporation, the assignee of the entire right, title and interest in the above application.

RELATED APPEALS AND INTERFERENCES

There are no appeals or interferences known to Applicant or the undersigned which will directly affect, or be affected by or have a bearing on the Board's decision in the appeal.

STATUS OF CLAIMS

Claims 1, 3, and 5-12 are pending, finally rejected, and are the claims on appeal. Claims 2 and 4 have been canceled. The pending claims appear in the Appendix.

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A response to the final rejection was filed. The response has been entered.

SUMMARY OF THE INVENTION

Applicants' invention as defined by independent claim 1 is directed to a method of treating a ceramic core after molding and before firing for use in casting molten metallic material. The method involves the steps of placing an unfired ceramic core having a

molded core shape and having an organic binder on at least one setter and placing the at least one setter and the unfired ceramic core thereon on a conveyor that conveys the at least one setter and the unfired core through a heating oven wherein the setter and the unfired ceramic core are heated to an elevated temperature at or above a softening temperature of the binder effective to soften the binder to reduce distortion of the unfired ceramic core. The setter and the unfired ceramic core having softened organic binder are removed from the oven to cool to ambient temperature (see specification page 2, lines 5-17; page 7, lines 4-10 and lines 31-35; page 8, lines 14-21, and core 10, setters 40, 42 and conveyor 50 of Figure 1 and Figure 3).

Claim 3 depends from claim 1 and involves the step of controlling the rate of travel of the conveyor such that the at least one setter and the unfired ceramic core are heated to the elevated temperature when they are located proximate an exit opening of the heating oven (see specification page 2, lines 22-26; page 7, lines 31-35 and Figure 3).

Claim 5 depends from claim 1 and describes that the setter supplies heat to the unfired ceramic core after removal from the heating oven and during cooling to ambient temperature (see specification page 2, lines 28-32; page 8, lines 17-21 and core 10 and setters 40, 42 of Figure 1).

Claim 6 depends from claim 1 and describes that the unfired ceramic core conforms to a surface of the setter by being heated to the elevated temperature (see specification page 2, lines 11-14 and page 8, lines 22-26 and Figure 1).

Claim 7 depends from claim 1 and describes that the unfired ceramic core is placed between a top setter and a bottom setter and is conveyed through the heating oven between the top setter and bottom setter (see specification page 5, lines 18-30 and page 6, lines 10-14; and setters 40, 42 of Figure 1, 1A).

Claim 8 depends from claim 1 and describes that the unfired ceramic core includes an airfoil region (see specification page 3, lines 2-5; page 4, lines 30-31 and airfoil region 14 of Figure 2).

Claim 9 depends from claim 1 and describes that the binder comprises a thermosetting binder (see specification page 3, lines 33-35 and page 8, lines 4-10).

Claim 10 depends from claim 1 and describes that the binder comprises a thermoplastic binder (see specification page 3, lines 25-26).

Claim 11 is an independent claim that involves a method of treating a ceramic core after molding and before firing for use in casting molten metallic material and that includes the steps of heating an unfired ceramic core having a molded core shape and having an organic binder on at least one setter in a heating oven to an elevated temperature at or above a softening temperature of the binder effective to soften the binder to reduce distortion of the unfired ceramic core and removing the at least one setter and the unfired ceramic core having softened organic binder from the oven to cool to ambient temperature (see specification page 2, lines 5-17; page 7, lines 4-10 and lines 31-35; page 8, lines 14-21, and core 10, setters 40, 42 and conveyor 50 of Figure 1 and 3).

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ISSUES

FIRST ISSUE

The first and only issue presented for review is whether the subject matter of claims 1, 3, and 5-12 is obvious under 35 USC 103(a) in view of the Frank et al. US Patent 4 837 187 or European document EP 0 914 883 taken with the Japanese document JP-3-97675.

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Claims 1, 3, and 5-12 do not stand or fall together. Claims 1 and 11 are independent claims which are separately patentable since claim 1 further recites the step of placing the at least one setter and the unfired ceramic core thereon on a conveyor that conveys the setter and the unfired core through a heating oven. Depending claim 3 is separately patentable from claim 1 in further reciting controlling the rate of travel of the conveyor such that the at least one setter and the unfired ceramic core are heated to the elevated temperature when they are located proximate an exit opening of the heating oven. Depending claim 5 is separately patentable from claim 1 in further reciting that the at least one setter supplies heat to the unfired ceramic core after removal from the heating oven and during cooling to ambient temperature. Depending claim 6 is separately patentable from claim 1 in further reciting that the unfired ceramic core conforms to a surface of the at least one setter by being heated to the elevated temperature. Depending claim 7 is separately patentable from claim 1 in further reciting that the unfired ceramic core is placed between a top setter and a bottom setter and is conveyed through the heating oven between the top setter and bottom setter. Depending claim 8 is separately patentable from claim 1 in further reciting that the unfired ceramic core includes an airfoil region. Depending claim 9 is separately patentable from claim 1 in further reciting that

the binder comprises a thermosetting binder. Depending claim 10 is separately patentable from claim 1 in further reciting that the binder comprises a thermoplastic binder. Depending claim 12 is separately patentable from claim 11 in further reciting that the unfired ceramic core includes an airfoil region.

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The thermoplastic wax-based binder no doubt is liquid at the temperature of the prebake treatment to allow its extraction by the graphite powder packing material via capillary action as described at column 5, lines 16-17.

In contrast, Applicants pending claims recite, in combination with the other steps set forth, heating the setter and the unfired ceramic core to an elevated temperature at or above the softening temperature of the organic binder effective to soften the organic binder to reduce distortion of the unfired ceramic core followed by removing the setter and the unfired ceramic core having softened organic binder from the oven to cool to ambient temperature.

The examiner should not ignore the recitations in Applicants' claims that the organic binder is softened to reduce distortion of the unfired ceramic core and that the setter and the unfired ceramic core having softened organic binder are removed from the oven to cool to ambient temperature. These recitations of claims 1 and 11 are not disclosed or suggested by the Frank '187 patent.

With respect to the EP '883 document, it is as grossly deficient as the Frank '187 patent since the disclosures cited by the examiner are essentially the same. In particular, page 4, lines 22-29 of the EP '883 document referred to by the examiner also relate to subjecting a green core removed from the die to a pre-bake treatment at 550 to 560 degrees F with graphite powder packing material covering the green core to extract or remove the thermoplastic wax-based binder from the ceramic core. In particular, page 4, lines 25-26 of the EP '883 document expressly teaches that "[a]fter the core is positioned on bottom half of the ceramic setter, it is covered with a graphite powder packing material which serves to physically extract via capillary action the binder from the core in a debinding action".

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Again, the examiner should not ignore the recitations in Applicants' claims that the organic binder is softened to reduce distortion of the unfired ceramic core and that the setter and the unfired ceramic core having softened organic binder are removed from the oven to cool to ambient temperature. These recitations of claims 1 and 11 are not disclosed or suggested by the EP '883 document.

The examiner's argument on page 4, third paragraph of the final rejection that "[t]herefore, Frank et al. and EP'883 disclose the claimed invention as claimed" is utterly incorrect and appears to be based on a misunderstanding of each cited primary reference.

In fact, neither the Frank '187 patent nor the EP '883 document discloses or suggests Applicants' pending claims. Both the Frank '187 patent and the EP '883 document expressly teach away from Applicants' pending claims in physically extracting or removing via capillary action the binder from the core in the pre-bake heat treatment referred to by the examiner. The examiner's

interpretation of the cited references is violative of the principles of the Grahm V. Deere decision, 383 U.S. 1 (1966) since the cited references in fact expressly teach away from Applicants' claims.

The examiner acknowledges on page 3, paragraph 4 of the final rejection that the Frank '187 patent and the EP '883 document do not disclose the method of conveying the setter and the unfired core into a heating oven as set forth in claim 1. The examiner cites Japanese '675 document as allegedly remedying the gross deficiencies of the Frank '187 patent and the EP '883 document in this regard.

However, the Japanese '675 document involves high temperature sintering of ferrite cores by firing in an oxygen-containing gas to produce high magnetic permeability cores as described in the translation of the abstract. A temperature of 1350 degrees C appears on page 455, right hand column, line 8 of the untranslated Japan document. The Japanese '675 document is not believed to be instructive with respect to Applicants' claims given that the Japanese '675 document involves high temperature sintering of ferrite cores via firing at over 1300 degrees C to produce high magnetic permeability ferrite cores. The examiner should not and cannot under accepted patent examining principles of the Grahm V. Deere decision select only the disclosure of a conveyor out of the Japanese '675 document while ignoring that the Japanese '675 document involves sintering ferrite cores to obtain high magnetic permeability and sintering temperatures of over 1300 degrees C.

Moreover, the combination of the Japanese '675 document with the Frank '187 patent or the EP '883 document as proposed by the examiner is believed incorrect since the Japanese '675 document

involves sintering (firing) at very high temperatures over 1300 degrees C and the pre-bake treatment of Frank '187 patent and the EP '883 document involves graphite powder packing material covering the green core to extract the organic binder from the ceramic core at relatively low temperatures before firing.

Applicants fail to see any motivation in the cited references to combine the Japanese '675 document with the Frank '187 patent or the EP '883 document. Applicants believe the proposed combination of the Japanese '675 document with the Frank '187 patent or the EP '883 document is violative of the principles set forth in the above Grahm v. Deere decision.

With respect to claim 3, neither the Frank '187 patent, the EP '883 document, nor the Japanese '675 document discloses or suggests controlling the rate of travel of a conveyor such that a setter and an unfired ceramic core are heated to the elevated temperature when they are located proximate an exit opening of the heating oven.

With respect to claim 5, neither the Frank '187 patent, the EP '883 document, nor the Japanese '675 document discloses or suggests supplying heat from a setter to an unfired ceramic core after removal from the heating oven and during cooling to ambient temperature.

With respect to claim 6, neither the Frank '187 patent, the EP '883 document, nor the Japanese '675 document discloses or suggests conforming an unfired ceramic core to a surface of at least one setter by being heated to the elevated temperature by softening organic binder in the ceramic core.

With respect to claim 7, neither the Frank '187 patent, the EP '883 document, nor the Japanese '675 document discloses or suggests placing an unfired ceramic core between a top setter and a bottom setter and conveying the unfired ceramic core through a heating oven between the top setter and bottom setter while softening organic binder in the ceramic core.

With respect to claim 8, neither the Frank '187 patent, the EP '883 document, nor the Japanese '675 document discloses or suggests heat treating an unfired ceramic core that includes an airfoil region to soften organic binder in the ceramic core.

With respect to claim 9, neither the Frank '187 patent, the EP '883 document, nor the Japanese '675 document discloses or suggests heat treating an unfired ceramic core that includes a thermosetting binder in a manner to soften the thermosetting binder.

With respect to claim 10, neither the Frank '187 patent, the EP '883 document, nor the Japanese '675 document discloses or suggests heat treating an unfired ceramic core that includes a thermoplastic binder in a manner to soften the binder. As mentioned above, the Frank '187 patent and the EP '883 document extract or remove the binder via graphite powder by capillary action.

With respect to claim 12, neither the Frank '187 patent, the EP '883 document, nor the Japanese '675 document discloses or suggests heat treating an unfired ceramic core that includes an airfoil region to soften binder in the ceramic core.

CONCLUSION

FIRST ISSUE

It is respectfully submitted that pending claims 1, 3, and 5-12 are not obvious in view of the Frank et al. US Patent 4 837 187 or European document 0 914 883 taken with the Japanese document JP-3-97675.

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OIPE JC109
OCT 06 2003
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APPENDIX

1. A method of treating a ceramic core after molding and before firing for use in casting molten metallic material, comprising placing an unfired ceramic core having a molded core shape and having an organic binder on at least one setter, placing said at least one setter and said unfired ceramic core thereon on a conveyor that conveys said at least one setter and said unfired core through a heating oven, conveying said at least one setter and said unfired ceramic core through the heating oven to heat said at least one setter and said unfired ceramic core to an elevated temperature at or above a softening temperature of said binder effective to soften said binder to reduce distortion of said unfired ceramic core, and removing said at least one setter and said unfired ceramic core having softened organic binder from said oven to cool to ambient temperature.

3. The method of claim 1 including controlling the rate of travel of the conveyor such that said at least one setter and said unfired ceramic core are heated to said elevated temperature when they are located proximate an exit opening of the heating oven.

5. The method of claim 1 wherein said at least one setter supplies heat to said unfired ceramic core after removal from the heating oven and during cooling to ambient temperature.

6. The method of claim 1 wherein said unfired ceramic core conforms to a surface of said at least one setter by being heated to said elevated temperature.

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7. The method of claim 1 wherein said unfired ceramic core is placed between a top setter and a bottom setter and is conveyed through the heating oven between the top setter and bottom setter.

8. The method of claim 1 wherein said unfired ceramic core includes an airfoil region.

9. The method of claim 1 wherein the binder comprises a thermosetting binder.

10. The method of claim 1 wherein the binder comprises a thermoplastic binder.

11. A method of treating a ceramic core after molding and before firing for use in casting molten metallic material, comprising a) heating an unfired ceramic core having a molded core shape and having an organic binder on at least one setter in a heating oven to an elevated temperature at or above a softening temperature of said binder effective to soften said binder to reduce distortion of said unfired ceramic core and b) removing said at least one setter and said unfired ceramic core having softened organic binder from said oven to cool to ambient temperature.

12. The method of claim 11 wherein the said unfired ceramic core includes an airfoil region.

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IN THE US PATENT AND TRADEMARK OFFICE

September 25, 2003

Applicants: Bobby A. Dixon, et al.
Title : METHOD OF TREATING CERAMIC CORES
Serial No.: 09/805,426 Group: 1725
Filed : March 13, 2001 Examiner: L. Tran
Confirmation No. 2086

Commissioner for Patents
P.O. Box 1450
Alexandria, VA 22313-1450

APPELLANT'S BRIEF ON APPEAL

Dear Sir:

This is an appeal from the decision of the Examiner dated June 3, 2003, finally rejecting claims 1, 3 and 5-12.

REAL PARTY IN INTEREST

The real party in interest is Howmet Research Corporation, the assignee of the entire right, title and interest in the above application.

RELATED APPEALS AND INTERFERENCES

There are no appeals or interferences known to Applicant or the undersigned which will directly affect, or be affected by or have a bearing on the Board's decision in the appeal.

STATUS OF CLAIMS

Claims 1, 3, and 5-12 are pending, finally rejected, and are the claims on appeal. Claims 2 and 4 have been canceled. The pending claims appear in the Appendix.

STATUS OF AMENDMENTS

A response to the final rejection was filed. The response has been entered.

SUMMARY OF THE INVENTION

Applicants' invention as defined by independent claim 1 is directed to a method of treating a ceramic core after molding and before firing for use in casting molten metallic material. The method involves the steps of placing an unfired ceramic core having a

molded core shape and having an organic binder on at least one setter and placing the at least one setter and the unfired ceramic core thereon on a conveyor that conveys the at least one setter and the unfired core through a heating oven wherein the setter and the unfired ceramic core are heated to an elevated temperature at or above a softening temperature of the binder effective to soften the binder to reduce distortion of the unfired ceramic core. The setter and the unfired ceramic core having softened organic binder are removed from the oven to cool to ambient temperature (see specification page 2, lines 5-17; page 7, lines 4-10 and lines 31-35; page 8, lines 14-21, and core 10, setters 40, 42 and conveyor 50 of Figure 1 and Figure 3).

Claim 3 depends from claim 1 and involves the step of controlling the rate of travel of the conveyor such that the at least one setter and the unfired ceramic core are heated to the elevated temperature when they are located proximate an exit opening of the heating oven (see specification page 2, lines 22-26; page 7, lines 31-35 and Figure 3).

Claim 5 depends from claim 1 and describes that the setter supplies heat to the unfired ceramic core after removal from the heating oven and during cooling to ambient temperature (see specification page 2, lines 28-32; page 8, lines 17-21 and core 10 and setters 40, 42 of Figure 1).

Claim 6 depends from claim 1 and describes that the unfired ceramic core conforms to a surface of the setter by being heated to the elevated temperature (see specification page 2, lines 11-14 and page 8, lines 22-26 and Figure 1).

Claim 7 depends from claim 1 and describes that the unfired ceramic core is placed between a top setter and a bottom setter and is conveyed through the heating oven between the top setter and bottom setter (see specification page 5, lines 18-30 and page 6, lines 10-14; and setters 40, 42 of Figure 1, 1A).

Claim 8 depends from claim 1 and describes that the unfired ceramic core includes an airfoil region (see specification page 3, lines 2-5; page 4, lines 30-31 and airfoil region 14 of Figure 2).

Claim 9 depends from claim 1 and describes that the binder comprises a thermosetting binder (see specification page 3, lines 33-35 and page 8, lines 4-10).

Claim 10 depends from claim 1 and describes that the binder comprises a thermoplastic binder (see specification page 3, lines 25-26).

Claim 11 is an independent claim that involves a method of treating a ceramic core after molding and before firing for use in casting molten metallic material and that includes the steps of heating an unfired ceramic core having a molded core shape and having an organic binder on at least one setter in a heating oven to an elevated temperature at or above a softening temperature of the binder effective to soften the binder to reduce distortion of the unfired ceramic core and removing the at least one setter and the unfired ceramic core having softened organic binder from the oven to cool to ambient temperature (see specification page 2, lines 5-17; page 7, lines 4-10 and lines 31-35; page 8, lines 14-21, and core 10, setters 40, 42 and conveyor 50 of Figure 1 and 3).

Claim 12 depends from claim 11 and describes that the unfired ceramic core includes an airfoil region (see specification page 3, lines 2-5; page 4, lines 30-31 and airfoil region 14 of Figure 2).

ISSUES

FIRST ISSUE

The first and only issue presented for review is whether the subject matter of claims 1, 3, and 5-12 is obvious under 35 USC 103(a) in view of the Frank et al. US Patent 4 837 187 or European document EP 0 914 883 taken with the Japanese document JP-3-97675.

GROUPING OF THE CLAIMS

Claims 1, 3, and 5-12 do not stand or fall together. Claims 1 and 11 are independent claims which are separately patentable since claim 1 further recites the step of placing the at least one setter and the unfired ceramic core thereon on a conveyor that conveys the setter and the unfired core through a heating oven. Depending claim 3 is separately patentable from claim 1 in further reciting controlling the rate of travel of the conveyor such that the at least one setter and the unfired ceramic core are heated to the elevated temperature when they are located proximate an exit opening of the heating oven. Depending claim 5 is separately patentable from claim 1 in further reciting that the at least one setter supplies heat to the unfired ceramic core after removal from the heating oven and during cooling to ambient temperature. Depending claim 6 is separately patentable from claim 1 in further reciting that the unfired ceramic core conforms to a surface of the at least one setter by being heated to the elevated temperature. Depending claim 7 is separately patentable from claim 1 in further reciting that the unfired ceramic core is placed between a top setter and a bottom setter and is conveyed through the heating oven between the top setter and bottom setter. Depending claim 8 is separately patentable from claim 1 in further reciting that the unfired ceramic core includes an airfoil region. Depending claim 9 is separately patentable from claim 1 in further reciting that

the binder comprises a thermosetting binder. Depending claim 10 is separately patentable from claim 1 in further reciting that the binder comprises a thermoplastic binder. Depending claim 12 is separately patentable from claim 11 in further reciting that the unfired ceramic core includes an airfoil region.

ARGUMENT

FIRST ISSUE:

The rejection of claims 1, 3, and 5-12 as obvious under 35 USC 103(a) in view of the Frank et al. US Patent 4 837 187 (Frank '187 patent) or European document EP 0 914 883 (EP '883 document) taken with the Japanese document JP-3-97675 (Japanese '675 document) is in error.

With respect to the Frank '187 patent, the examiner alleges that the Frank '187 patent discloses "a method of treating a ceramic core after molding and before firing for use in casting molten metallic material comprising the steps of placing the unfired ceramic core and having organic binder, thermoplastic, on one of the setter, then heating the unfired ceramic core to or above the softening temperature of the binder". The examiner cites column 5, lines 6-21 of Frank '187 patent. Applicants would point out to the examiner that column 5, lines 6-21 relate to subjecting the green core removed from the die to a pre-bake treatment at 232 to 288 degrees C maximum temperature with graphite powder packing material covering the green core <u>to extract or remove the thermoplastic wax-based binder</u> from the ceramic core. In particular, column 5, lines 11-17 of the Frank '187 patent expressly teaches that "[a]fter the core is positioned on bottom half of the ceramic setter, the core is covered with a graphite powder packing material having a relatively fine particle size. During the pre-bake treatment, the graphite powder packing material serves to physically extract, via capillary action, the binder material from the core".

The thermoplastic wax-based binder no doubt is liquid at the temperature of the prebake treatment to allow its extraction by the graphite powder packing material via capillary action as described at column 5, lines 16-17.

In contrast, Applicants pending claims recite, in combination with the other steps set forth, heating the setter and the unfired ceramic core to an elevated temperature at or above the softening temperature of the organic binder effective to soften the organic binder to reduce distortion of the unfired ceramic core followed by removing the setter and the unfired ceramic core having softened organic binder from the oven to cool to ambient temperature.

The examiner should not ignore the recitations in Applicants' claims that the organic binder is softened to reduce distortion of the unfired ceramic core and that the setter and the unfired ceramic core having softened organic binder are removed from the oven to cool to ambient temperature. These recitations of claims 1 and 11 are not disclosed or suggested by the Frank '187 patent.

With respect to the EP '883 document, it is as grossly deficient as the Frank '187 patent since the disclosures cited by the examiner are essentially the same. In particular, page 4, lines 22-29 of the EP '883 document referred to by the examiner also relate to subjecting a green core removed from the die to a pre-bake treatment at 550 to 560 degrees F with graphite powder packing material covering the green core to extract or remove the thermoplastic wax-based binder from the ceramic core. In particular, page 4, lines 25-26 of the EP '883 document expressly teaches that "[a]fter the core is positioned on bottom half of the ceramic setter, it is covered with a graphite powder packing material which serves to physically extract via capillary action the binder from the core in a debinding action".

The thermoplastic wax-based binder no doubt is liquid at the temperature of the prebake treatment to allow its extraction by the graphite powder packing material via capillary action as described at page 4, lines 25-26 of the EP '883 document.

In contrast, Applicants pending claims recite, in combination with the other steps set forth, heating the setter and the unfired ceramic core to an elevated temperature at or above the softening temperature of the organic binder effective to soften the organic binder to reduce distortion of the unfired ceramic core followed by removing the setter and the unfired ceramic core having softened organic binder from the oven to cool to ambient temperature.

Again, the examiner should not ignore the recitations in Applicants' claims that the organic binder is softened to reduce distortion of the unfired ceramic core and that the setter and the unfired ceramic core having softened organic binder are removed from the oven to cool to ambient temperature. These recitations of claims 1 and 11 are not disclosed or suggested by the EP '883 document.

The examiner's argument on page 4, third paragraph of the final rejection that "[t]herefore, Frank et al. and EP'883 disclose the claimed invention as claimed" is utterly incorrect and appears to be based on a misunderstanding of each cited primary reference.

In fact, neither the Frank '187 patent nor the EP '883 document discloses or suggests Applicants' pending claims. Both the Frank '187 patent and the EP '883 document expressly teach away from Applicants' pending claims in physically extracting or removing via capillary action the binder from the core in the pre-bake heat treatment referred to by the examiner. The examiner's

interpretation of the cited references is violative of the principles of the Grahm V. Deere decision, 383 U.S. 1 (1966) since the cited references in fact expressly teach away from Applicants' claims.

The examiner acknowledges on page 3, paragraph 4 of the final rejection that the Frank '187 patent and the EP '883 document do not disclose the method of conveying the setter and the unfired core into a heating oven as set forth in claim 1. The examiner cites Japanese '675 document as allegedly remedying the gross deficiencies of the Frank '187 patent and the EP '883 document in this regard.

However, the Japanese '675 document involves high temperature sintering of ferrite cores by firing in an oxygen-containing gas to produce high magnetic permeability cores as described in the translation of the abstract. A temperature of 1350 degrees C appears on page 455, right hand column, line 8 of the untranslated Japan document. The Japanese '675 document is not believed to be instructive with respect to Applicants' claims given that the Japanese '675 document involves high temperature sintering of ferrite cores via firing at over 1300 degrees C to produce high magnetic permeability ferrite cores. The examiner should not and cannot under accepted patent examining principles of the Grahm V. Deere decision select only the disclosure of a conveyor out of the Japanese '675 document while ignoring that the Japanese '675 document involves sintering ferrite cores to obtain high magnetic permeability and sintering temperatures of over 1300 degrees C.

Moreover, the combination of the Japanese '675 document with the Frank '187 patent or the EP '883 document as proposed by the examiner is believed incorrect since the Japanese '675 document

involves sintering (firing) at very high temperatures over 1300 degrees C and the pre-bake treatment of Frank '187 patent and the EP '883 document involves graphite powder packing material covering the green core to extract the organic binder from the ceramic core at relatively low temperatures before firing.

Applicants fail to see any motivation in the cited references to combine the Japanese '675 document with the Frank '187 patent or the EP '883 document. Applicants believe the proposed combination of the Japanese '675 document with the Frank '187 patent or the EP '883 document is violative of the principles set forth in the above Grahm v. Deere decision.

With respect to claim 3, neither the Frank '187 patent, the EP '883 document, nor the Japanese '675 document discloses or suggests controlling the rate of travel of a conveyor such that a setter and an unfired ceramic core are heated to the elevated temperature when they are located proximate an exit opening of the heating oven.

With respect to claim 5, neither the Frank '187 patent, the EP '883 document, nor the Japanese '675 document discloses or suggests supplying heat from a setter to an unfired ceramic core after removal from the heating oven and during cooling to ambient temperature.

With respect to claim 6, neither the Frank '187 patent, the EP '883 document, nor the Japanese '675 document discloses or suggests conforming an unfired ceramic core to a surface of at least one setter by being heated to the elevated temperature by softening organic binder in the ceramic core.

With respect to claim 7, neither the Frank '187 patent, the EP '883 document, nor the Japanese '675 document discloses or suggests placing an unfired ceramic core between a top setter and a bottom setter and conveying the unfired ceramic core through a heating oven between the top setter and bottom setter while softening organic binder in the ceramic core.

With respect to claim 8, neither the Frank '187 patent, the EP '883 document, nor the Japanese '675 document discloses or suggests heat treating an unfired ceramic core that includes an airfoil region to soften organic binder in the ceramic core.

With respect to claim 9, neither the Frank '187 patent, the EP '883 document, nor the Japanese '675 document discloses or suggests heat treating an unfired ceramic core that includes a thermosetting binder in a manner to soften the thermosetting binder.

With respect to claim 10, neither the Frank '187 patent, the EP '883 document, nor the Japanese '675 document discloses or suggests heat treating an unfired ceramic core that includes a thermoplastic binder in a manner to soften the binder. As mentioned above, the Frank '187 patent and the EP '883 document extract or remove the binder via graphite powder by capillary action.

With respect to claim 12, neither the Frank '187 patent, the EP '883 document, nor the Japanese '675 document discloses or suggests heat treating an unfired ceramic core that includes an airfoil region to soften binder in the ceramic core.

CONCLUSION

FIRST ISSUE

It is respectfully submitted that pending claims 1, 3, and 5-12 are not obvious in view of the Frank et al. US Patent 4 837 187 or European document 0 914 883 taken with the Japanese document JP-3-97675.

Respectfully submitted,

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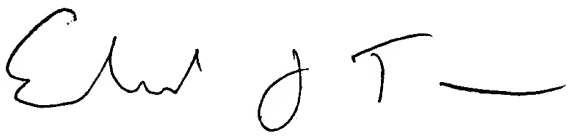

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Encl. Appendix and Postal Card

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1. A method of treating a ceramic core after molding and before firing for use in casting molten metallic material, comprising placing an unfired ceramic core having a molded core shape and having an organic binder on at least one setter, placing said at least one setter and said unfired ceramic core thereon on a conveyor that conveys said at least one setter and said unfired core through a heating oven, conveying said at least one setter and said unfired ceramic core through the heating oven to heat said at least one setter and said unfired ceramic core to an elevated temperature at or above a softening temperature of said binder effective to soften said binder to reduce distortion of said unfired ceramic core, and removing said at least one setter and said unfired ceramic core having softened organic binder from said oven to cool to ambient temperature.

3. The method of claim 1 including controlling the rate of travel of the conveyor such that said at least one setter and said unfired ceramic core are heated to said elevated temperature when they are located proximate an exit opening of the heating oven.

5. The method of claim 1 wherein said at least one setter supplies heat to said unfired ceramic core after removal from the heating oven and during cooling to ambient temperature.

6. The method of claim 1 wherein said unfired ceramic core conforms to a surface of said at least one setter by being heated to said elevated temperature.